ABSTRACT

In the past, the majority of research aimed at understanding the composition and sources contributing to $PM_{2.5}$ concentrations in California has been focused on major field campaigns that have been concentrated over relatively short periods of time (weeks to months). While these studies have contributed a great deal to our understanding of aerosol particles, they have focused primarily on one region during one season. This report will detail the significant progress that has been made towards understanding how aerosol sources and chemistry vary temporally and spatially within California, information that is critical to assessing the health impacts of air pollution on individuals living in various regions of the state. The development of a trailer housing many air pollution instruments as a mobile platform for sampling has been a key enabling step in this research that has allowed for rapid deployment and the ability to sample in multiple locations over short periods of time. This increased flexibility has allowed us to obtain detailed information regarding the variations of aerosol properties both seasonally and spatially. The variations in particle concentrations and chemistry over very short time periods have allowed us to investigate changes in plumes from both roadways and ship traffic. In addition to changes in particles over different intervals of time, studies were conducted to investigate the changes in aerosol particle properties within a city scale range over the period of one air mass (3 days) and one day. Observations were also made of particle transport within California both locally (city-scale) and regionally (city-to-city). The second focus of this project has been to provide more detailed mass concentrations from aerosol time-of-flight mass spectrometry (ATOFMS) data, which has been achieved through scaling with respect to standard mass based measurements such as the MOUDI and TEOM. Advances have also been made in our ability to apportion individual particles to different sources building on a library of source signatures that has been developed through work with CARB over the last decade. Specifically, measuring changes in particle properties as they age and take up secondary material and the impact on the original source signatures has been investigated through the use of a thermodenuder, which has led to improved source apportionment capabilities of aerosols in highly aged environments.